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N° XXX.

Observations on the annual Passage of Herrings, by
Mr. JOHN GILPIN.

AS this very useful part of the finny race has never been found in the fresh rivers, or waters of Europe, it remains a query amongst the naturalists, where they go to spawn and perpetuate their species. I apprehend this query may be answered to the satisfaction of the curious by an account of their annual progress, from which it will appear they are a fish of passage, and observe one regular annual rout in the sea, shifting their climate with the sun, and that it is the same school which is found at different times about Britain and in America. This opinion is founded on observations made on seeing them caught at Whitehaven and in this country, from which I have not observed that there is any visible difference in the fish in the different places, except that those at Whitehaven are fatter and rounder than those in America; but this difference is not so great as that between the spring and fall mackarel, and which I conceive might be accounted for from the time of the year, and manner in which they appear on each coast. For they are found on the other side the Atlantic, or rather in the North sea, in the favourable month of June about the islands of Shetland, from whence they proceed down to the Orkneys, and then dividing, they surround the islands of Great-Britain and Ireland, and unite again off the Land's End in the British channel in September, from whence this grand united school steers south-west, and is not found any more on that side or in the Atlantic, until the same time the ensuing year, but appear next on the American coasts.

coasts. They arrive in Georgia and Carolina the latter end of January, and in Virginia in February; and coasting from thence eastward to New-England, they divide and go into all the bays, rivers, creeks and even small streams of water in amazing quantities, and continue spawning in the fresh water until the latter end of April, when the old fish return into the sea, where they change their latitudes by a northward direction and arrive at Newfoundland in May; after which we neither hear or see any thing more of them in America, until their return amongst us the ensuing spring, and bring with them a providential blessing to the poor. Their coming sooner or later up our rivers depends on the warmth or coolness of the season: And it is further observed that if a few warm days invite them up, and cool weather succeeds, it totally checks their passage until more warm weather returns. From all which circumstances it appears probable there is a certain degree of warmth particularly agreeable to them, which they endeavour to enjoy by changing their latitude according to the distances of the sun. Thus they are found in the British channel in September, but leave it when the sun is at too great a distance from them in the southern hemisphere, and push for a more agreeable climate; and when the weather in America becomes too warm in May, (after having deposited their eggs in shallow water and secured their young fry from the fish of prey,) steer the course which leads to the cooler northern seas, and by that prudent change of place perpetually enjoy the temperature of climate best adapted to their nature; which from the table hereto annexed, shewing the places and times of their visitation, and the calculation of the distance of the sun at those times from them, is that degree of warmth which is produced by the mean distance between 37 to 43 degrees; except whilst they are spawning; during which they bear a greater degree of heat from the necessity of remaining in it a short time to spawn; and also on the other extreme, when detained at too great a distance by the island of Great-Britain and its dependencies.

Here another query occurs, what becomes of the young fry, the produce of the spawn they left in the fresh waters of America? We know they do not follow the old ones the first season, because they are found in great scooles in all the American bays during the summer, and disappear in the fall, from whence it may rationally be supposed that from their natural propensity to keep at a certain distance from the sun, the season leads them to a different course from the old ones, by which they meet their parentage about the latitude 23° N. and 70° W. longitude, and there tack about and follow the older ones; which, being larger and stronger than the younger, come first into our harbours, but are fewer in number than the lesser, probably from having suffered great loss and pillage in their long rout from the fish of prey, and their greater enemies the fishermen in the different parts of the world.

A Table shewing nearly about the place of the grand scoole of herrings, and their mean distance from the sun.

* Place and Time.		Latitude.	Longitude.	Sun's Declination.	The mean Distance.
I.	January,	23	70	20 S.	43
II.	February,	32	79	12	44
III.	March,	36	75	0	36
IV.	April,	39	72	10 N.	29
V.	May,	49	50	19	30
VI.	June,	65	15	23	42
VII.	July,	58	0	21	37
VIII.	August,	52	0	14	38
IX.	September,	48	6	0	48
X.	October,	35	22	9	44
XI.	November,	22	40	18	40
XII.	December,	18	52	23	41

* See Map B, in Plate V.

Some Observations and Reasons given for the course of the Herrings, and the variation in their Mean Distance from the Sun in different months of the year.

[See Map B, Plate V.]

JANUARY. In this month the herrings are supposed to be returning from too warm a climate and the approaching sun, from which they retreat fast.

FEBRUARY. The time of spawning now drawing nigh, the herrings, in this month pass through the gulph stream, and fall on the coast of America, in order to deposit their spawn in fresh shoal water.

MARCH. Now being the beginning of the time of spawning, the largest and strongest fish, which perhaps are the oldest, rush up into the bays, inlets and fresh water streams.

APRIL. In this month the lesser, weaker, and perhaps younger fish, rush up even to the heads of small streams, as far as it is possible for them to get, and lay their spawn. These are twice as numerous as the other.

MAY. Having been detained by the spawning season, they are overtaken by the sun, and nearer to it now than at any other time; they therefore hasten out of the rivers in this month, and make great way towards the North sea.

JUNE. Now having by a rapid progress pushed into a cold climate, on a chilly, icy coast, and the sun beginning to draw towards the south, they whirl round eastward.

JULY. The coldness of this sea, and the sun's declination towards the south, now inclines them that way, in which they fall on the Orkneys, and the shoole divides.

AUGUST. The grand shoole being divided, now surround the whole island of Great-Britain and Ireland, and are caught on every side.

SEPTEMBER. Having been detained the last month by their obstruction amongst the islands, and being harraßed by the fishermen, their mean distance is now the greatest; they collect into one body and hasten to the southward.

OCTOBER. Being now under great way, they lessen their mean distance, and by the course which they steer, which perhaps is inclined more westward by the current of the trade wind, they pass the Atlantic.

NOVEMBER. Being now more in the trade, and having approached a warmer climate, their motion is supposed to incline more westward.

DECEMBER. The sun now beginning to return, they are supposed to incline more northward, to the place where we began; where they are supposed to meet their young fry.

N° XXXI.

Observations on a Solar and a Lunar Eclipse, communicated to the Society by M. M. De GRAUCHAIN, Major General of the French Squadron.

(Translated from the French.)

GENTLEMEN,

Newport, 5th December, 1780.

THE study of astronomy having often occupied my leisure during the peace, I could not refuse myself even in the midst of the preparations for war, an opportunity